

## Traffic Operations

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**Project Title:** Modernize Census Infrastructure Technology

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## Modernize Census Infrastructure Technology

Conduct a literature review of the latest developments in the census research industry, such as theoretical advancements, research projects, pilot projects, and applications implemented in the field.

### WHAT IS THE NEED?

Recent technology advancements have offered a great variety of technologies that would help to modernize the traffic census data collection effort. However, these solutions differ in many aspects, such as the maturity of the technology, the initial startup and overall life-cycle cost, the deployment requirements, and performance metrics of the equipment. We need a holistic research effort to review the existing and emerging technologies and evaluate them systematically for traffic census data collection applications.

We will develop a practical, strategic roadmap of recommendations for Caltrans to deploy the most promising census infrastructure technologies. This roadmap will create and consider an evaluation matrix with lifecycle cost analyses, as well as other relevant factors such as scalability, interoperability with existing infrastructure, and regulatory considerations.

### WHAT ARE WE DOING?

Using the insights from our evaluation matrix and lifecycle cost analysis, we will create technology recommendations tailored to different traffic scenarios. We will consider the unique demands of each scenario—freeways, arterials, intersections, and ramps—and suggest the most effective technology for each. Under each of these scenarios, we will also consider various use cases such as traffic operations (e.g., signal control), active traffic management, and safety analytics. For example, we might suggest LiDAR at high-crash, complex intersections for its better spatial resolution and ability to detect stationary or slow-moving objects, particularly for vulnerable road users. Our recommendations are not one-size-fits-all but consider each scenario's unique demands.



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The research is anticipated to achieve the following outcomes:

1. Conduct a literature review and assessment of new technologies and industrial solutions.
2. Provide recommendations for technology use types for mainline, intersections, and ramps for traffic census related applications.
3. Provide recommendations of equipment locations across the State Highway System.
4. The research will provide an overview of life-cycle cost analysis for each technology.

## WHAT IS OUR GOAL?

We will develop a practical, strategic roadmap of recommendations for Caltrans to deploy the most promising census infrastructure technologies. This roadmap considers the evaluation matrix and lifecycle cost analyses, as well as other relevant factors such as scalability, interoperability with existing infrastructure, and regulatory considerations.

## WHAT IS THE BENEFIT?

The data this research will provide is essential information needed by Caltrans to develop better safety programs, better planning of future transportation infrastructure, better execution of construction projects, better maintenance, and asset management programs. Ultimately, the research aims to provide Caltrans with insightful, comprehensive, and practical guidance to adopt efficient, cost-effective, and advanced traffic census systems. This research builds upon initial technological evaluation work done at UCLA. The benefit of this research is that it will provide recommended, suitable technologies for continuous performance monitoring in Caltrans Districts.

## WHAT IS THE PROGRESS TO DATE?

The literature review for task one explored a wide range of technologies employed in traffic census data collection. Traditional methods such as

Inductive Loop and Magnetometer technologies, as well as more advanced approaches like Video Detection Systems, Infrared Sensors, Traffic Radar, and LiDAR, were evaluated. The report provided in the task one deliverable discusses each technology's strengths, limitations, cost, environmental performance, and potential for future use.